

REMARKS

Status of the Claims

Claims 2-5, 7-10, 13, 15, 19-48, 51-59, 63-81, and 83-109 have been withdrawn as non-elected. Claims 1, 6, 11, 12, 14, 16-18, 49, 50, 60, 61, 82, and 110 are under consideration and have been rejected.

Claims 1, 6, 11, 12, 14, 16-18, 49, 50, 60, 61, 82, and 110 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Vong et al. (US Pub. No. 2004/0021415) in view of Tang et al. (US Pat. No. 5,294,870).

By this amendment, Applicant is amending claim 1 and canceling claim 110.

Applicant calls the Examiner's attention to the fact that the present application is a CIP of a parent case that was filed on April 24, 2002. Vong et al. is not a reference for the material disclosed in the parent case. With respect to claim 1, all of the material is supported by the parent case except for that portion of d i), which reads "or the first component of the mixture...in the absence of the aggregate state" and also newly added d iii). The original claim in the parent case is identical except for these two parts.

The Examiner states that Vong et al.'s luminescent region may comprise...pyrene and the like. Applicant would like to call the Examiner's attention to the fact that Vong et al. refers to "pyrene and the like" which is believed to be a reference to pyrene and other molecules which are dominated by the pyrene chromophore. The material in claim 82 benzo[a]pyrene is dominated by an anthracene chromophore as evidenced by its absorption and emission spectra and therefore, is not like pyrene and behaves quite differently from a usual pyrene derivative.

The Examiner takes the position that although Vong et al. failed to exemplify a luminescent region comprising AlQ₃ and both a pyrene derivative and DCJTB, it would have been obvious to one of ordinary skill in the art at the time of the invention to have formed a layer with AlQ₃, pyrene derivative, and DCJTB. The Examiner further states that since pyrene derivative and DCJTB are both taught as useful dopants it is obvious to use their mixture for the same purpose.

It is an established law that an obvious to try situation cannot be used to reject a claim. This is a classical obvious to try situation. By now, there are tens

of thousands of organic compounds that have been shown useful in OLEDs. One cannot simply take any three compounds found useful in OLED and combine them in a luminescent layer and expect good performance, even less so improvements to result from it. If this were the case, we would have had a myriad of useful mixtures around already, but we do not. Very few mixtures have been proven to be useful, and even fewer have been found to be beneficial for operating a lifetime of OLEDs, possibly because the exact mechanism of device degradation is still unknown. Much consideration needs to be given before putting three components together into a luminescent layer and obtaining good performance in drive voltage, electroluminescence (EL) efficiency and color, and an improvement in operating lifetime. This is indeed the subject of the present invention which applicant believes is unobvious. The requirements for material selection are only shown in the present application and are nowhere present in the prior art.

Consider the reference by Vong et al. alone. Combining materials suggested for a luminescent layer of this reference would lead to at least a few thousands of various three-component mixtures. Would they all be useful? No, by any means they would not. Would the useful ones be obvious to one skilled in the art? Clearly, no.

The Examiner in sections 4 and 5 takes the position that pyrene derivatives of Vong et al. and Tang et al. are used for the same purpose as set forth in the present invention that is, as emissive dopants. However, the purpose of the first host component of claim 1 is different from that of pyrene derivatives in Vong et al. and Tang et al. Both references intend for pyrene derivatives to be used as light-emitting dopants while our purpose for the first host component benzo[a]pyrene is entirely different (and does not obviously stem from the previously shown purpose): It is to be non-emitting, see section d iii) of claim 1 (fully supported by the specification). It is in no way obvious that the materials that emit light in order to improve EL efficiency and color in one application can be used as non-emitting species in order to improve operating lifetime in another. A material that emits light and thus, improves color and EL efficiency in one application hardly performs the same function as the same material that is used as a non-emitting species and improves operating lifetime in another.

The Examiner states “These materials are deemed to have the same functions, properties and capabilities as those recited by applicant” (Section 5). Applicant respectfully disagrees. As described above, the functions are different. The properties are different too as they are concentration-sensitive: the pyrene dopants of Vong et al. and Tang et al. require use of low concentrations, 1% or less, in order to be at their best EL efficiency (thus, their behavior is characteristic of pyrene monomer) although in the present invention the concentrations are relatively high, ~10% and more, to promote formation of aggregate species. The capabilities are also different, first, because the concentrations are different (which leads to emission color being different and lifetime being different – there is no lifetime extension at low concentrations but there is lifetime extension at higher concentrations), and second, no one has shown before that benzo[a]pyrene is capable of extending operating lifetime as a first host component of the present invention. Moreover, the exact mechanism of this lifetime extension remains to be discovered. It is then quite unobvious that aggregation may be related to lifetime extension. Thus, prediction of the lifetime-extending effect was impossible until the present invention. Clearly, the present invention as exemplified by amended claim 1 is new and unobvious and should be allowed.

With respect to section 4, the Examiner should note that benzo[a]pyrene is not well suited as a light-emitting dopant in OLEDs, as it results in quite poor device performance because it is a poor emitter. It readily aggregates which severely quenches its fluorescence and messes up emission color.

It is quite unexpected that incorporation of the first host component in a luminescent layer results in such large improvements in operating lifetime. Thus, the invention is not only unobvious but shows an unexpected advantage over the prior art, where such operating lifetime improvements over comparative examples combined with such long lifetimes have never been demonstrated. Neither Vong et al. nor Tang et al. taken singly or in combination disclose the subject matter of claim 1. Moreover, they do not disclose that the addition of benzo[a]pyrene at relatively high concentrations, as to promote aggregate formation, improves lifetime.

With respect to section 5, a material is defined as host not only by its amount but also by its function: if its function is to transfer its excitation energy to the light-emitting dopant, then it can be classified as a host material, distinctly

different from dopant. A material classified as a host or a host component in a luminescent layer is non-emitting in the presence of a dopant by definition. Claim 1 section d iii) clearly specifies that the dopant is the only species in the luminescent layer that emits light and the host components are non-emitting. None of the prior art suggest this.

As pointed out above, the claimed structure provides advantages not suggested by the prior art. The advantages of the present invention clearly support applicant's position of unobviousness.

It is believed that these changes now make the claims clear and definite and, if there are any problems with these changes, Applicants' attorney would appreciate a telephone call.

In view of the foregoing, it is believed none of the references, taken singly or in combination, disclose the claimed invention. Accordingly, this application is believed to be in condition for allowance, the notice of which is respectfully requested.

Respectfully submitted,



Attorney for Applicant(s)
Registration No. 22,363

Raymond L. Owens/djw
Rochester, NY 14650
Telephone: 585-477-4653
Facsimile: 585-477-4646

If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.